

**Amendments to the Claims:**

This listing of claims will replace all prior versions, and listings, of claims in the application:

**Listing of Claims:**

1. (Currently amended) A device for efficiently detecting subatomic particles comprising:

a detector assembly, said detector assembly comprising:

a first plurality of transducers; and

at least one detector crystal optically coupled to at least some of said first plurality of transducers, wherein a single detector crystal in said at least one detector crystal having has a plurality of slits, each slit being approximately equivalent in length as each other slit and said plurality of slits being oriented parallel to the optical axis of said at least some of said first plurality of transducers;

a plurality of processors, said plurality of processors being arranged in a plurality of substantially parallel layers, and each of said some processors in said plurality of processors being capable of communicating with processors to each lateral side in one substantially parallel layer, receiving communication from a processor in a second substantially parallel layer and transmitting to a third processor in a third substantially parallel layer; and wherein

a plurality of channels, each of the first plurality of channels being coupled to one of each transducer in the first plurality of transducers is in electrical communication with and at least three one processor in of the plurality of processors, the three of the plurality of processors being in the first, second and third substantially parallel layers;

a plurality of channels, each of the plurality of channels being coupled to one of the plurality of transducers and at least three of the plurality of processors, the three of the plurality of processors being in the first, second and third substantially parallel layers; and

a pyramidal funneling structure, said pyramidal funneling structure comprising a plurality of funnel input processors, each of the plurality of funnel input processors being coupled to a channel and having two of the plurality of funnel input processors coupled to an interior funnel processor.

2. (Currently amended) The device recited in claim 1 above, wherein said at least one detector crystal forms a first side and an opposing second side and wherein said first plurality

of transducers are optically coupled to said first side, the detector assembly further ~~comprises~~:  
comprising:

a second plurality of transducers, said second plurality of transducers optically coupled to the at least one detector crystal, the second plurality of transducers being coaxial with at least some of the first plurality of transducers, wherein said second plurality of transducers are optically coupled to said second side, and wherein a surface area of a face of a transducer in said second plurality of transducers is smaller than a surface area of a face of a transducer in said first plurality of transducers; and wherein each transducer in the second plurality of transducers is in electrical communication with at least one processor in said plurality of processors.

3. (Currently amended) The device recited in claim 2 above, wherein a light guide is ~~the second plurality of transducers~~ optically coupled between a detector crystal in the at least one detector crystal and a transducer in the second plurality of transducers.

4. (Currently amended) The device recited in claim 2 above, wherein at least one of the plurality of processors performs a depth of interaction calculation.

5. (New) The device recited in claim 1 above, the device further comprising a pyramidal funneling structure, said pyramidal funneling structure comprising a plurality of funnel input processors, and wherein a funnel input processor in the plurality of funnel input processors is coupled to a processor in the plurality of processors of claim 1.

6. (New) The device recited in claim 1 above, wherein a transducer in said first plurality of transducers is a photomultiplier (PMT) or an avalanche photodiode (APD).

7. (New) The device recited in claim 2 above, wherein a transducer in said second plurality of transducers is a photomultiplier (PMT), an avalanche photodiode (APD), or a photodiode.

8. (New) The device recited in claim 1 above, wherein a detector crystal in the at least one detector crystal is a bismuth germinate (BGO) crystal or a sodium iodate (NaI) crystal.

9. (New) The device recited in claim 2 above, wherein said at least one detector crystal defines a barrel around a patient and wherein the first plurality of transducers are arranged on

an exterior face of said barrel and said second plurality of transducers are arranged on an interior face of said barrel.

10. (New) The device recited in claim 9 above, wherein said at least one detector crystal is a single detector crystal.

11. (New) The device recited in claim 9 above, wherein said barrel is segmented into sectors, and wherein said at least one detector crystal consists of four separate detector crystals, each detector crystal in said four separate detector crystals occupying a different sector of said barrel.

12. (New) The device recited in claim 9 above, wherein said barrel is segmented into sectors, and wherein said at least one detector crystal consists of two separate detector crystals, each detector crystal in said two separate detector crystals occupying a different sector of said barrel.

13. (New) The device recited in claim 1 above, wherein a processor in said plurality of processors is a FPGA.

14. (New) The device recited in claim 1 above, wherein a processor in said plurality of processors is an ASIC.

15. (New) The device recited in claim 1 above, wherein the timing of a processor in said plurality of processors is provided by two in-phase clocks at 20 MHz and 40 MHz.

16. (New) The device recited in claim 2 above, wherein  
a first transducer in the first plurality of transducers is in electrical communication  
with a first processor in said plurality of processors; and  
a second transducer in said second plurality of transducers is in electrical  
communication with said first processor.

17. (New) The device recited in claim 16 above, wherein said first processor is in a first substantially parallel layer in said plurality of substantially parallel layers and wherein said first processor is in electrical communication with four other processors in said first substantially parallel layer.

18. (New) The device recited in claim 17, wherein said first processor is in electrical communication with a second processor in a second substantially parallel layer in said plurality of substantially parallel layers.
19. (New) The device recited in claim 1, wherein the subatomic particles are photon pairs.